TRANSPOWER

Interconnecting Transformer Classification Updates 2025

This document summarises the updated interconnecting transformer CER classifications during 2025

Version: 1

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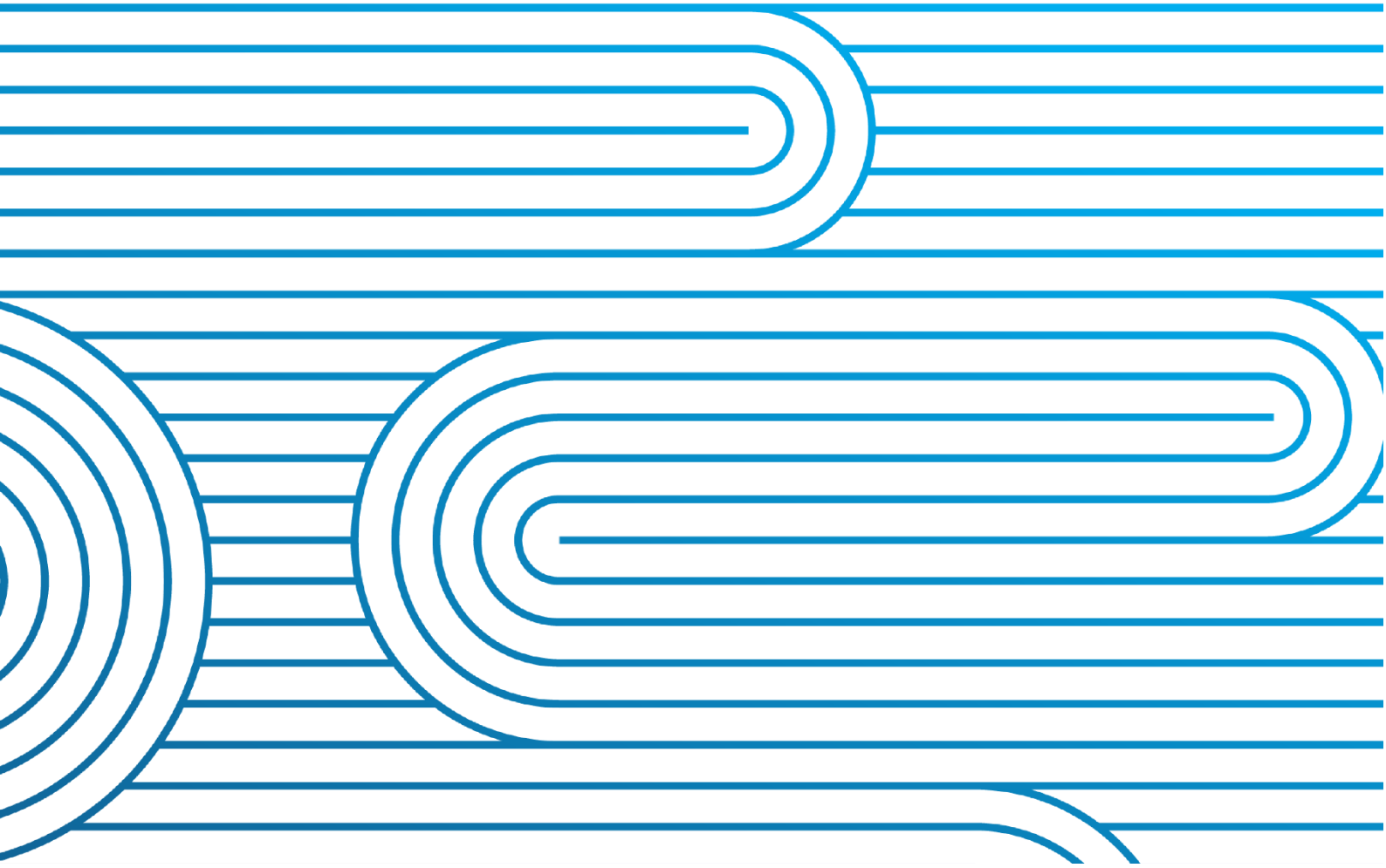

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1	25/09/2025	Approved for publication

IMPORTANT

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1.1 Redclyffe Interconnecting Transformers

Region: Grid Zone 5 Hawkes Bay

Redclyffe has 2 x 220/110 kV interconnecting transformers and the existing Redclyffe Transformer Overload Protection scheme has been permanently disabled.

- Redclyffe T4 (T4A & T4B) with a combined rating of 196/208 MVA
- Redclyffe T5 rated 250/250 MVA

  (summer post contingency/winter post contingency MVA).
- The planned pre-contingent load flow through when both interconnecting transformers are in service is 220 MVA.

The network being considered is highlighted in Figure 1 where Redclyffe T4A & T4B are depicted as the combined T4.

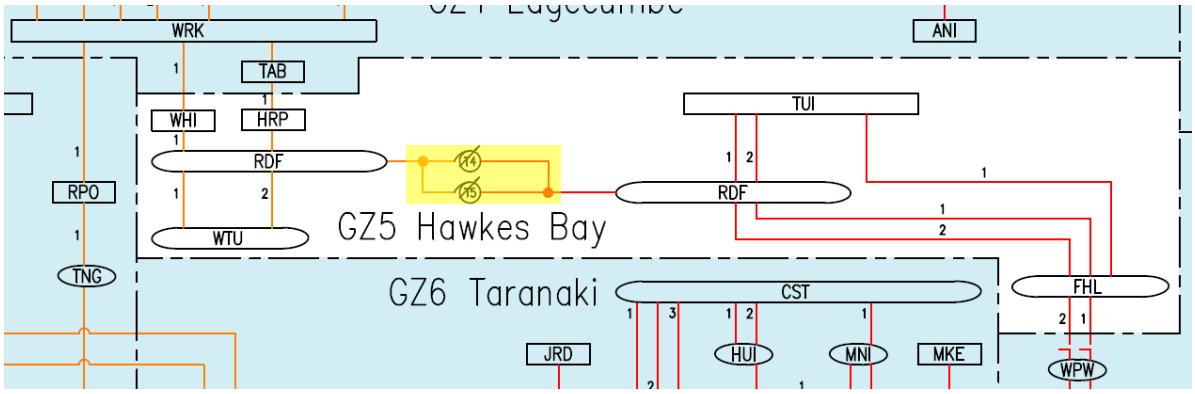

Figure 1: Grid Zone 5

N-1 (normal conditions)

Event: Loss of Redclyffe T5

Probability of ICT faults per year: 0.06 **Average fault duration**: 14 hours

There are no issues following a contingency of Redclyffe T4 or T5, however there is a small risk that following a contingency of T5, the T4 thermal protection may not operate fast enough to prevent excessive transformer degradation or even a fault. CE and ECE classifications have been costed below, however there is a concern that while the impact of overloading and damaging T4 has not been including in the costing, the necessary repair/replacement would have a significant cost and duration.

Due to the significant increase of importing capacity into the 110 kV Hawkes Bay region and the impact this may have on generation dispatch from Tuai, the existing generation data has not been used for forecasting. Instead, a worst case scenario has been assumed where Tuai is providing 0 MW and the entire Hawkes Bay 110 kV load is being supplied through the Redclyffe interconnecting transformers.

With 0 MW from Tuai generation, the probability of Hawkes Bay 110 kV load exceeding 220 MVA is 0.04%. The average load above the limit is 228 MW, so the generation response or load loss required is 8 MW. Load flow studies suggest the existing Fernhill-Redclyffe constraints will bind and bring on Tuai generation before single transformer rating constraints are exceeded, however these studies show the results are close and if conditions differ significantly from the load flow assumptions, this constraint may no longer bind first.

The CE approach would involve constraining Tuai generation on whenever Hawkes Bay 110 kV load exceeds 220 MVA, the ECE approach would involve post contingency demand reduction following a contingency of T5.

Annual Cost: generation response

Scenario	Location	Generation or Demand Response (MW)	Unit Cost ($/MWh)	Duration (h)	Event Cost ($)	Event Risk Factor	Load Risk Factor	Annualised Cost ($)
Base	Tuai generation response	8	$194	8760	$13.6 M	1	0.0004	**$5,400**
Sensitivity	Tuai generation response	8	$346	8760	$24.2 M	1	0.0004	**$9,700**

Annual Cost: post-contingency load reduction

Scenario	Location	Load Lost (MW)	Unit Cost ($/MWh)	Fault Duration (h)	Event Cost ($)	Event Risk Factor	Load Risk Factor	Equipment Request Factor	Annualised Cost ($)
Base	Hawkes Bay 110 kV load	8	$32,700	14	$3.7 M	0.06	1	0.0004	**$88**
Sensitivity	Hawkes Bay 110 kV load	8	$32,700	14	$3.7 M	0.12	1	0.0004	**$176**

N-1-1 (planned outage conditions)

Planned Outage: Redclyffe T4 or T5

Event: Loss of Redclyffe T4 or T5

Probability of ICT faults per year: 0.06

Average fault duration: 14 hours

During a planned outage of one interconnecting transformer (ICT), if the remaining ICT is loaded above its pre-contingency MVA rating, the scheduling pricing dispatch programme will constrain on generation to resolve this issue. This is regardless of the classification of the ICT.

The contingency of the remaining ICT during the planned outage of the first ICT will result in loss of load and generation in GZ5 110 kV network.

Classification Recommendation

Based on the annual costs above, these transformers would be classified as ECE. However, given the significant risk of damaging T4 and considering the constraint is only expected to bind 0.04% of the time, while other regional constraints will often bind first, the prudent approach is to continue to manage the Redclyffe interconnecting transformers as CE during normal and planned outage conditions.